MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2022/2023

DEM5046 – ALGEBRA & TRIGONOMETRY

03 OCTOBER 2023
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This exam paper consists of **3 pages** including the cover page with **four questions** only.

2. Answer **ALL** questions. All necessary working steps must be shown.

3. Write all your answers in the answer booklet provided.

Please answer ALL questions and show the necessary working. Total mark is equal to 100.

Question 1 (25 marks)

a) Perform long division to completely factor the rational expression

$$\frac{x^3 + 19x^2 + 36x + 4}{x + 2}$$

(4 marks)

b) With the assistance from your answer in part a), simplify the following

$$\frac{3x + 4}{x^2 - 4} - \frac{2x - 3}{x^2 + 4x + 4}$$

(7 marks)

c) Solve the following inequality and graph the solution set.

$$\frac{x(x^2 + x - 2)}{x^2 + 9x + 20} \leq 0, \quad x \neq -5, -4$$ (14 marks)

Question 2 (25 marks)

a) Let point $A(10,4)$ and point $B(-6,-12)$ are the endpoints of a diameter of a circle.

i) Find the line equation of AB in point-slope form and slope-intercept form. (3 marks)

ii) Determine the center and the radius of the circle. (3 marks)

iii) State the circle equation in general form. (3 marks)

iv) Find two points on the circle's circumference, which intersects with a line perpendicular to line AB that passes through the center of the circle. (8 marks)

b) Find the exact value of

i) $\csc[\tan^{-1}(-1)]$ (4 marks)

ii) $4\sec\frac{3\pi}{4} - \cot\left(-\frac{\pi}{4}\right)$ (4 marks)

Continued...

Question 3 (25 marks)

a) Solve the equation $2\cos^2 x + \cos x - 1 = 0$ where $0 \le x \le 2\pi$. (6 marks)

b) Find the exact value of $\sin 2\theta$ given that $\cos\theta = \frac{4}{5}$ where $0 < \theta < 90°$. (4 marks)

c) Solve the systems of linear equations given below by using the Cramer's rule.

$$2x - 6z = -8$$
$$y + 2z = 3$$
$$3x + 6y - 2z = -4$$

(15 marks)

Question 4 (25 marks)

a) Simplify the equations in standard form: $a + bi$.

i) $(6 - i)(2 + 3i)$ (3 marks)

ii) $\frac{1+2i}{3-5i}$ (3 marks)

b) Sketch the complex number $\sqrt{3} + i$ in the complex plane. Convert the complex number to polar form and exponential form. (10 marks)

c) Find the complex cube roots of $4 + 4\sqrt{3}\,i$ using De Moivre's theorem. (9 marks)

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